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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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R C van Dijk

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Microphony uncoupled frame section in a cathode ray tube

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Microphony uncoupled frame section in a cathode ray tube

The present invention relates to a frame section adapted to form part of a shadow mask frame, within a cathode ray tube, having a hollow, generally rectangular shape and on which a shadow mask is mountable, said frame section including two flange portions of a thin-walled material arranged at an angle to each other, a first flange portion serving as a mask mounting flange having its width extended generally in parallel to the direction of the cathode rays and on which the shadow mask is mountable, whereas a second flange portion serving as a reinforcing flange having its width extended generally perpendicular to the direction of the cathode rays.

The invention also relates to a cathode ray tube comprising a color selection electrode with a frame including a frame section as indicated above.

In color cathode ray tubes, for e.g. television sets or computer monitors, it is a well known problem that the quality of the image deteriorate when the cathode ray tube is exposed to environmental vibration sources such as loud sounds, from e.g. speakers, or impacts. The picture resolution and the color purity degrades. The reason for this is that the shadow mask begin to oscillate when exposed to environmental vibrations, the so called microphony effect or behavior, having the effect that the cathode rays frequently impinge in the wrong spots of the image screen.

In recent years it has become more common to manufacture cathode ray tubes of shorter lengths, i.e. more "flat" tubes, in which the cathode rays are spread in a wider angle. Concurrently with this tendency it has been observed that the problem with microphony behavior of the cathode ray tubes, has increased.

In JP 6-44919 A, is disclosed a shadow mask body structure in which attempts has been made to solve the problems related to microphony behavior of the shadow mask, by forming of a pattern of horizontal and vertical beads on the body structure. These measures makes the body structure more stable and rigid, but the area susceptible to environmental vibrations is still the same and the resulting effect is that the resonance frequency of the body structure is raised.

It is an object of the present invention to provide a frame section which reduces the susceptibility of the shadow mask to oscillate due to environmental vibrations. At least this object is achieved by a frame section according to claim 1.

According to alternative embodiments of the invention, in respect of claim 6, there is provided a frame section with the further object to increase the stability and rigidity of the frame section.

Accordingly, the invention is based on the insight that the above-mentioned objects can be achieved by providing a through slit in the longitudinal direction of the reinforcing flange of the frame section. By this measure a large part of the area of the reinforcing flange, which is unfavorably affected by the environmental vibrations, can be uncoupled from the rest of the frame section, the frame and the shadow mask, and can oscillate independently without adversely affecting the shadow mask. Simultaneously the resonance frequency of the frame section is lowered, having as a result that the environmental vibration frequency which is affecting the frame section most, if desired can be lowered to a frequency below the audible frequency. Thus it is possible to filter out from the soundtrack of a program, the frequencies below a frequency slightly above the resonance frequency without audible affecting the sound.

The length of the slit can be varied in dependence of the actual situation, e.g. the width of the reinforcing flange portion or the resonance frequency of the frame and the shadow mask respectively. Generally the length of the slit is at least 50%, preferably at least 60% and most preferred at least 70% of the total length of the frame section. Furthermore, it is conceivable to arrange more than one slit in one and the same frame section if this is proved to be advantageous. It is preferred that a slit is continuous throughout its entire length. However, it would be possible to achieve the desired advantages with a slit interrupted by bridging portions. By varying the slit length, the number of slits or the position of the slit on the reinforcing flange portion, it is possible to "tune" the frame section, the assembled frame as well as the combination of the frame and shadow mask to fade-out a desired frequency or range of frequencies.

The frame sections making up the shadow mask frame can optionally be formed as separate sections which subsequently are assembled into the shadow mask frame. However, all the frame sections for a shadow mask can also be formed of a common blank which is bent and formed into the desired form of the shadow mask frame. It is also within

the scope of the invention that only one or a few of the frame sections making up the shadow mask frame can be formed with a slit.

According to an alternative embodiment of the invention, the slit in the reinforcing flange portion is combined with a bead or rib on the part of the reinforcing flange that is closest to the free inner edge of the frame section in relation to the slit. Preferably the rib is formed by corrugating the reinforcing flange and it extends in parallel to the slit. Like the slit, the rib can be varied in length, position and number and can be utilized to "tune" the frame section.

The invention will now be explained by way of example with reference to the accompanying drawings in which:

Fig. 1 is a plan view of a frame section according to the invention seen from the side of the reinforcing flange.

Fig. 2 is a cross sectional view along line II-II in fig 1.

Fig. 3 is a perspective view of an assembled shadow mask frame inserted in a front portion of a cathode tube envelope.

Fig. 4 is a plan view corresponding to fig 1 of an alternative embodiment.

In fig. 1 and 2 is shown a frame section 1 according to the invention in plan view and cross sectional view respectively. In the preferred embodiment the frame sections are manufactured as separate parts of which four frame sections are assembled into a rectangular shadow mask frame which is hollow in the center for the cathode rays. Each frame section includes a mask mounting flange 2, which can be designed in a number of different ways. The general principle is that the mask mounting flange in the completed cathode ray tube, will have its width extended essentially in parallel with the cathode rays and with an outer edge portion 3 directed towards the image screen of the cathode ray tube. The outer edge portion 3 of the mask mounting flange defines a double curved mounting surface for mounting of a shadow mask (at 4 in fig 3) so that it adopts the correct position and form.

Essentially perpendicular to the mask mounting flange, the frame section is formed with a reinforcing flange 5 which, in the completed cathode ray tube, is positioned with its width essentially perpendicular to the cathode rays. The reinforcing flange 5 has a

straight slit 6 as well as a straight rib 7 which both are extended in the longitudinal direction of the frame section. The rib 7 is positioned in the area between the slit and the edge portion of the frame section facing away from the mask mounting flange 2, to reinforce and stabilize the area of the frame section which becomes uncoupled from the mask mounting flange through the slit 6.

As evident from fig 2, the slit is formed by a straight cut through the reinforcing flange 5 and, subsequently, one of the edge portions adjacent the through cut is bent outward. The rib 7 is formed through a corrugation or folding in the reinforcing flange 5.

In fig 3 the shadow mask frame is shown in assembled condition of four individual frame sections 1 and positioned in a front portion of a tube envelope 8 which on the inner side is provided with an image screen layer. The frame sections 1 form a rectangular frame with a hollow center and with the respective mask mounting flanges 2 directed towards the image screen layer on the inside of the front portion of the tube envelope. A shadow mask 4 is mounted on the edge portions 3 of the mask mounting flange 2. The reinforcing flanges 5 of each frame section 1 are directed inward toward a rectangular opening enclosed by the frame sections. The uncoupling slit and the stabilizing rib are shown at 6 and 7 respectively. The individual frame sections are joined together and fastened to the tube envelope by means of fittings 9 in each corner of the shadow mask frame. The front portion of the tube envelope, with the shadow mask frame assembly therein, is eventually hermetically joined with a cone portion of the tube envelope along a rim 10 of the front tube envelope.

In fig 4 is shown an alternative embodiment of a frame section 1 according to the invention. In this embodiment there are arranged two slits 6 in parallel to each other, whereas one of the slits 6 is interrupted by a bridging portion 11. The embodiment is just an example of how the frame section according to the invention may be varied to "tune" the frame section in a desired way to achieve the best possible performance of the cathode ray tube.

In summary the present invention relates to a frame section 1 and a method for uncoupling of at least a part of a reinforcing flange 5 from the rest of the frame section, a shadow mask frame and a shadow mask 4 in a cathode ray tube. The shadow mask frame is composed of at least four frame sections arranged in a hollow, generally rectangular shape and the frame section includes two flange portions 2, 5 of a thin-walled material arranged at an angle to each other. A first flange portion serves as a mask mounting flange 2 having its width extended generally in parallel to the cathode rays, whereas a second flange portion

serves as a reinforcing flange 5 having its width extended generally perpendicular to the cathode rays. According to the invention a through slit 6 is formed in the longitudinal direction of the frame section.

CLAIMS:

1. A frame section adapted to form part of a shadow mask frame, within a cathode ray tube, having a hollow, generally rectangular shape and on which a shadow mask is mountable, said frame section including two flange portions of a thin-walled material arranged at an angle to each other, a first flange portion serving as a mask mounting flange having its width extended generally in parallel to the direction of the cathode rays and on which the shadow mask is mountable, whereas a second flange portion serving as a reinforcing flange having its width extended generally perpendicular to the direction of the cathode rays, characterized in that the reinforcing flange portion comprises an elongated through slit extending in the longitudinal direction of the frame section to reduce the microphony influence on the shadow mask.

2. A frame section according to claim 1, characterized in that the slit has a length of at least 50%.

3. A frame section according to claim 1, characterized in that the slit has a length of at least 60% of the total length of the frame section.

4. A frame section according to claim 1, characterized in that the slit has a length of at least 70% of the total length of the frame section.

5. A frame section according to anyone of the preceding claims, characterized in that the slit is formed as a through cut in the reinforcing flange and that at least one of the edge portions surrounding the cut is bent at either side to misalign the edge portions to form the slit.

6. A frame section according to anyone of the preceding claims, characterized in that the reinforcing flange also comprises a rib in the longitudinal direction of the frame section and positioned in the area between the slit and an inner edge.

7. A frame section according to anyone of the preceding claims, characterized in that more than one slit are arranged in parallel with each other in the reinforcing flange.

8. A frame section according to anyone of the preceding claims, characterized in that the slit is discontinuous along its length and interrupted of a bridging portion.

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9. A cathode ray tube comprising a color selection electrode with a frame including a frame section according to anyone of the preceding claims.

ABSTRACT:

The present invention relates to a frame section (1) and a method for uncoupling of at least a part of a reinforcing flange (5) from the rest of the frame section, a shadow mask frame and a shadow mask (4) in a cathode ray tube. The shadow mask frame is composed of at least four frame sections arranged in a hollow, generally rectangular shape and the frame section includes two flange portions (2, 5) of a thin-walled material arranged at an angle to each other. A first flange portion serves as a mask mounting flange (2) having its width extended generally in parallel to the cathode rays, whereas a second flange portion serves as a reinforcing flange (5) having its width extended generally perpendicular to the cathode rays. According to the invention a through slit (6) is formed in the longitudinal direction of the frame section.

Fig. 3

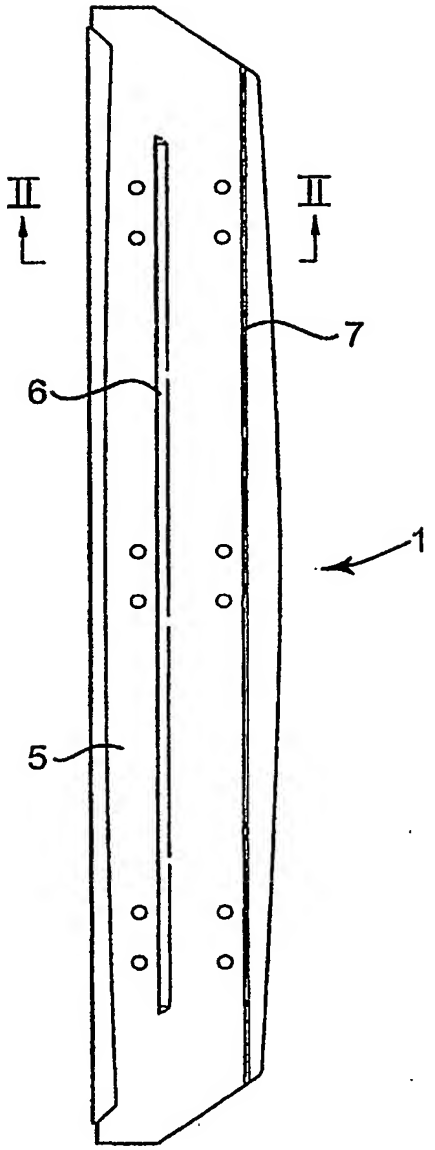

FIG. 1

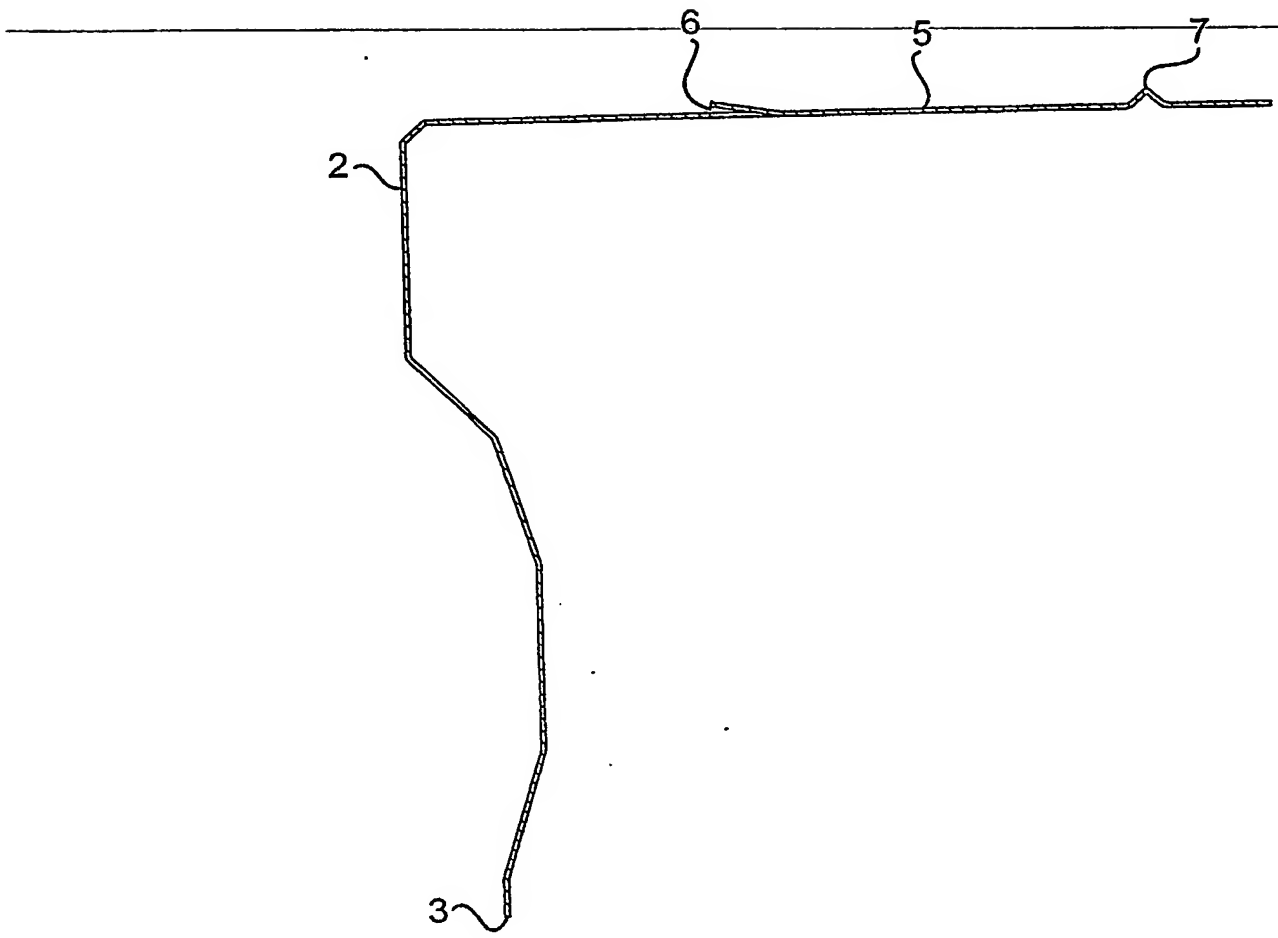

FIG. 2

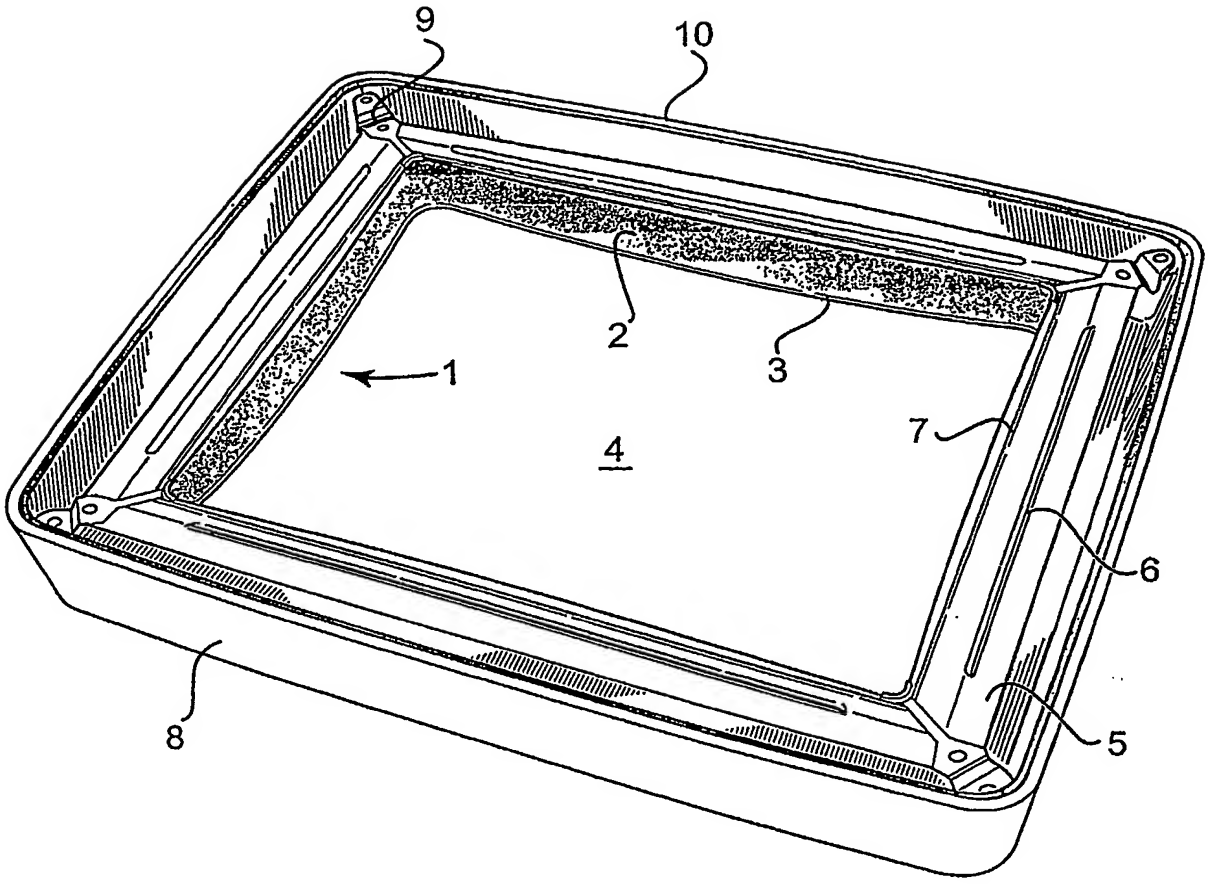

FIG. 3

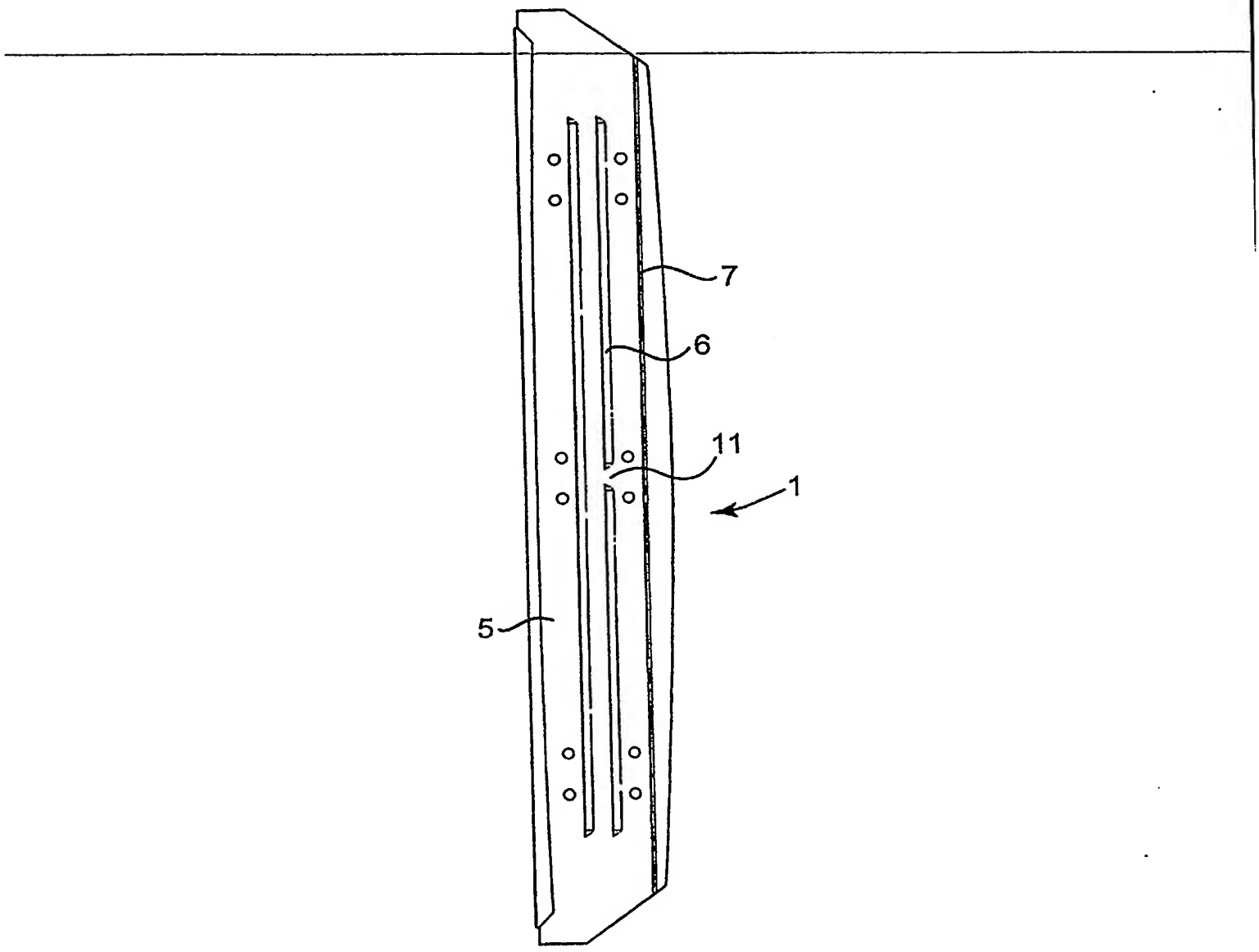

FIG. 4